INL has nominated advanced technologies in energy, radioisotope production and optics for the 2010 R&D 100 Awards, R&D Magazine's annual international competition to select the top 100 new technologies.

INL nominates energy, medicine, optics technologies for R&D 100 Awards

By Keith Arterburn, *INL Communications & Governmental Affairs*

Biodiesel production from wastes, medical imaging from better radioisotope production, and significantly improved gun sight optics highlight Idaho National Laboratory technologies nominated for the "top-of-the-world competition" in 2010.

INL demonstrates its diverse research capabilities by nominating its inventions for R&D Magazine's annual international competition to select the top 100 new technologies. INL has won 41 R&D 100 Awards since 1986. This year, advanced technologies in energy, radioisotope production and optics were nominated. INL researchers also are contributing to a fourth technology, which was nominated in collaboration with Ames National Laboratory and the National Energy Technology Laboratory.

Supercritical/Solid Catalyst (SSC)

Discarded and environmentally unfriendly wastes now can be converted into biodiesel fuels using a chemistry breakthrough called Supercritical/Solid Catalyst or SSC.

INL scientists Dan Ginosar, Bob Fox, Lucia Petkovic and Dan Wendt worked to find ways to create liquid fuels from a variety of waste streams, including municipal wastewater streams and food processing. Fox, working in supercritical fluids, and Ginosar, researching catalytic reactions, created patented inventions that produce high-quality B100 biodiesel from a variety of wastes.

SSC mixes fat or oil feedstock with supercritical fluid solvents and alcohols at specific temperatures and pressures to completely dissolve the materials during a single supercritical phase. This approach overcomes a key barrier — the polar liquid phase in conventional biodiesel production, which requires multiple steps.

BioFuelBox, Inc. of San Jose, Calif., scaled SSC in a successful demonstration of the technology at a pilot plant in American Falls, Idaho. Conventional biodiesel production requires high-quality oil sources, such as soybean oil or other food crops, but SSC takes the worst of wastes and revolutionizes production of high-quality B100 Biodiesel fuels using a single step.

SSC benefits include:
• Delivering a fuel that emits 86 percent fewer greenhouse gases than petroleum,
• Offering a secure, domestic fuel source,
• Eliminating the transportation and use of toxic material,
• Eliminating large amounts of clean water consumption during biodiesel production,
• Avoiding disposal costs and carbon dioxide-methane emissions by diverting 10 million pounds of waste from landfills per plant each year, and
• Potentially replacing 20 percent of petroleum diesel in the U.S., representing crude imports of 800,000 barrels per day.

Read the SSC Fact Sheet.

Accelerator Generation and Thermal Separation (AGATS)

The global shortage of key diagnostic and therapeutic pharmaceuticals could be answered by INL's Accelerator Generation and Thermal Separation (AGATS) process. It is an integrated system for producing technetium-99 and other medical radioisotopes.

Technetium-99 is a radioactive isotope used for imaging of lungs, bone, heart, renal flow, brain and more. Currently, it is produced within the intense neutron bombardment fields of the cores of nuclear reactors. At the moment, production essentially is limited to five small, aging research reactors on four continents, not all of which are operating at normal production levels.

AGATS has solved the difficulty of separating technetium from molybdenum, a parent isotope that can be produced in a linear electron accelerator. INL researchers developed a method of separating technetium-99 from molybdenum-99 by heating the product to vaporization and condensing the desired radioisotope, free of impurities.

AGATS benefits include:
• Avoiding nuclear reactor permitting, waste and proliferation concerns,
• Reducing capital costs and annual operating costs,
• Improving services with localized facilities, simplified distribution and product purity, and
• Reducing production costs and making technetium more affordable by about 50 percent.

INL's AGATS offers millions of patients a future with hope for sufficient and timely supplies of pure, highly-effective medical radioisotopes. David Petti, Blaine Grover, Woo Yoon, Troy Tranter, Ralph Bennett and four more researchers developed this technology, which has been licensed to NorthStar Nuclear Medicine of Madison, Wis-.

Read the AGATS Fact Sheet.

MicroSight

INL's MicroSight seems to transcend the laws of physics by simultaneously imaging two distinct focal planes so that a marksman can clearly focus on both the gun sight and the target.

INL engineer and avid competitive target shooter David Crandall developed MicroSight. Now hunters, target shooters and military marksmen will clearly see their targets and the sights at the end of their gun barrels simultaneously, which the human eye alone cannot do. This will dramatically improve a shooter's situational awareness with better vision, safety — because he actually will see the target — and performance by providing greater accuracy in aiming the weapon.

In the U.S. alone, there are more than 35 million hunters and target shooters, plus millions more around the world. For a small investment, MicroSight also would help U.S. military personnel improve combat weapons safety and performance. Durable and incredibly small, MicroSight adds less than 1/1000th of an ounce to the firearm, a premium for the military and hunters as it helps them avoid fatigue from carrying equipment long distances.

Crandall capitalized on an optical phenomenon called zone plates discovered in the early 1800s. Zone plates focus light differently than lenses. When light hits the plate, it diffracts or bends around the opaque zones and creates multiple focal points.

The MicroSight has been licensed by Apollo Optical of Rochester, NY, a world leader in lens design and engineering. Apollo Optical is currently working with various gun sight manufacturers to design specific MicroSights for various rifle applications.

Read the MicroSight Fact Sheet.

Iowa State-INL osgBullet

INL researcher David J. Muth, Jr. and Joshua B. Koch have worked with an Iowa State University team to develop osgBullet, which provides an open-source software toolkit that enables real-time creation and interaction with multi-body dynamics simulations in a 3D graphical environment. Ames National Laboratory researcher Douglas McCorkle is leading the R&D 100 submission team that includes INL and the National Energy Technology Laboratory.

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